CB-7012/12D/12F/12FD,
CB-7014D,
CB-7017/17F
User's Manual

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1. Introduction

CB-7000 is a family of network data acquisition and control modules. They provide analog-to-digital, digital-to-analog, digital input/output, timer/counter and other functions. These modules can be controlled remotely by a set of commands. Common features of analog input modules are as follows:

- 3000VDC isolated analog input.
- 24-bit sigma-delta ADC to provide excellent accuracy.
- Software calibration

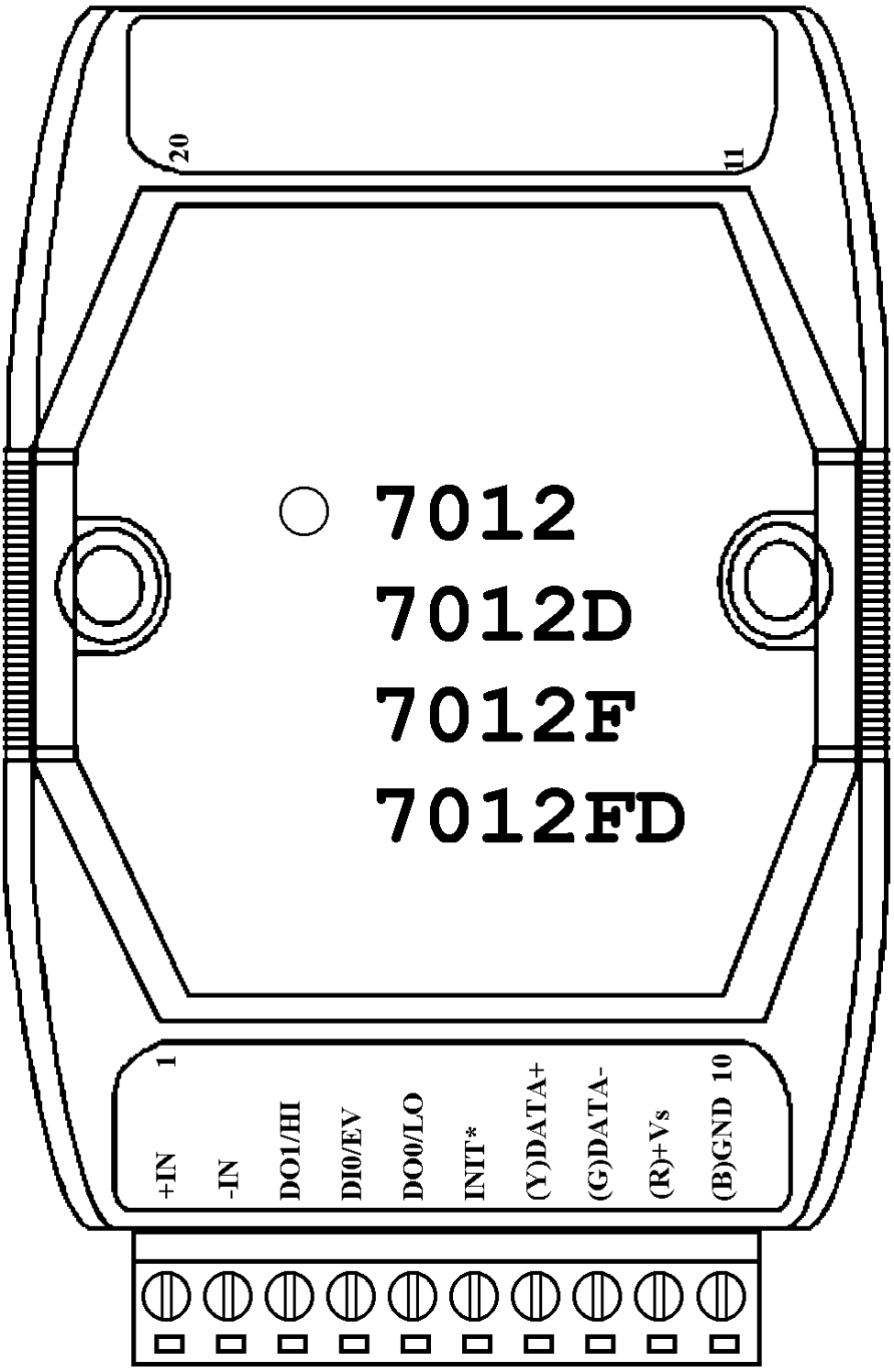
The CB-7012 is a single channel analog input module with high/low alarm function. The CB-7012D is the CB-7012 with a 4½ digit LED display. The CB-7012F/12FD is a CB-7012/12D with high speed analog input function. The CB-7014D is CB-7012D with Linear Mapping function and supports +15V loop power for a transmitter. The CB-7017 is an eight-channel analog input module. The CB-7017F is a CB-7017 with high speed analog inputs.

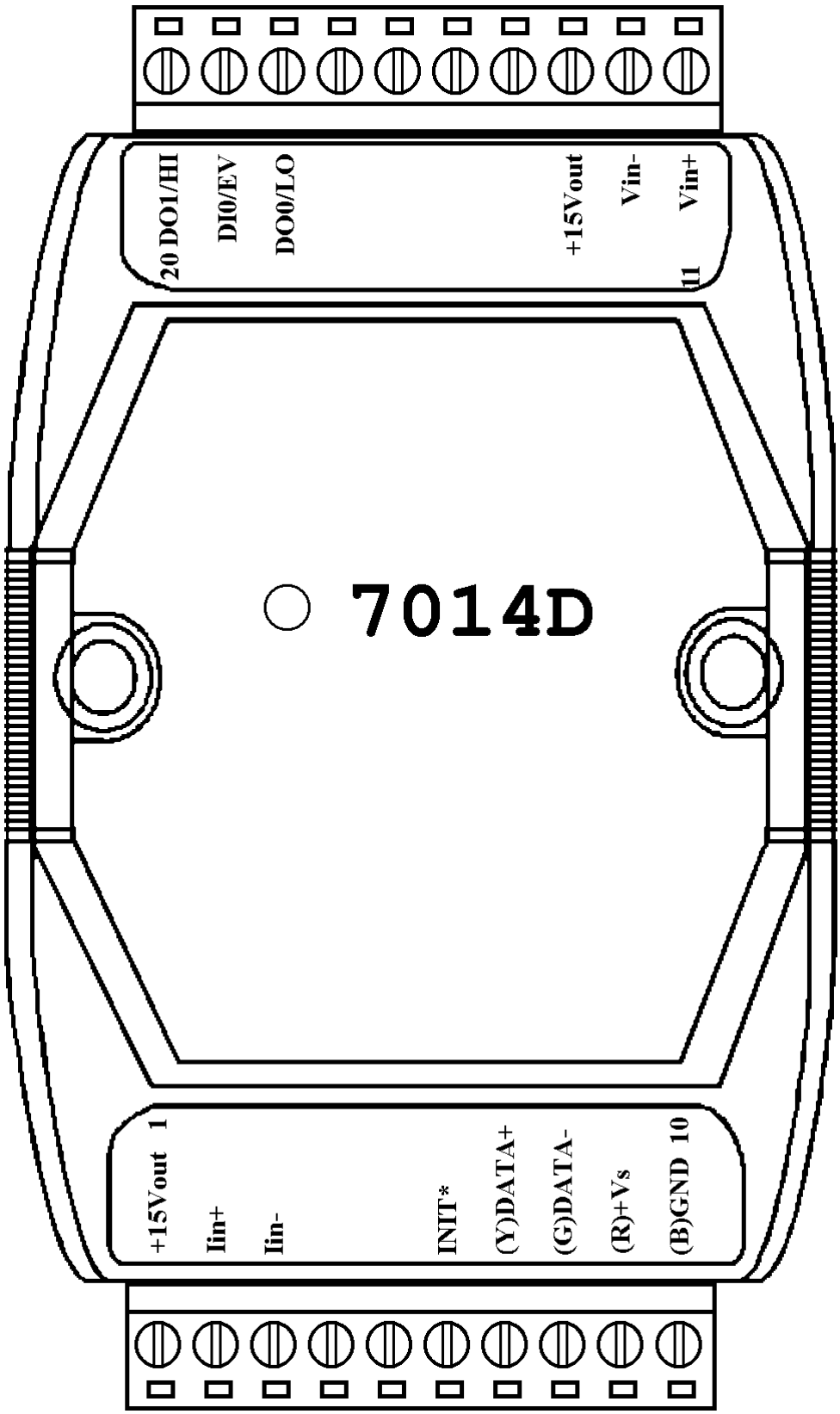
1.1 More Information

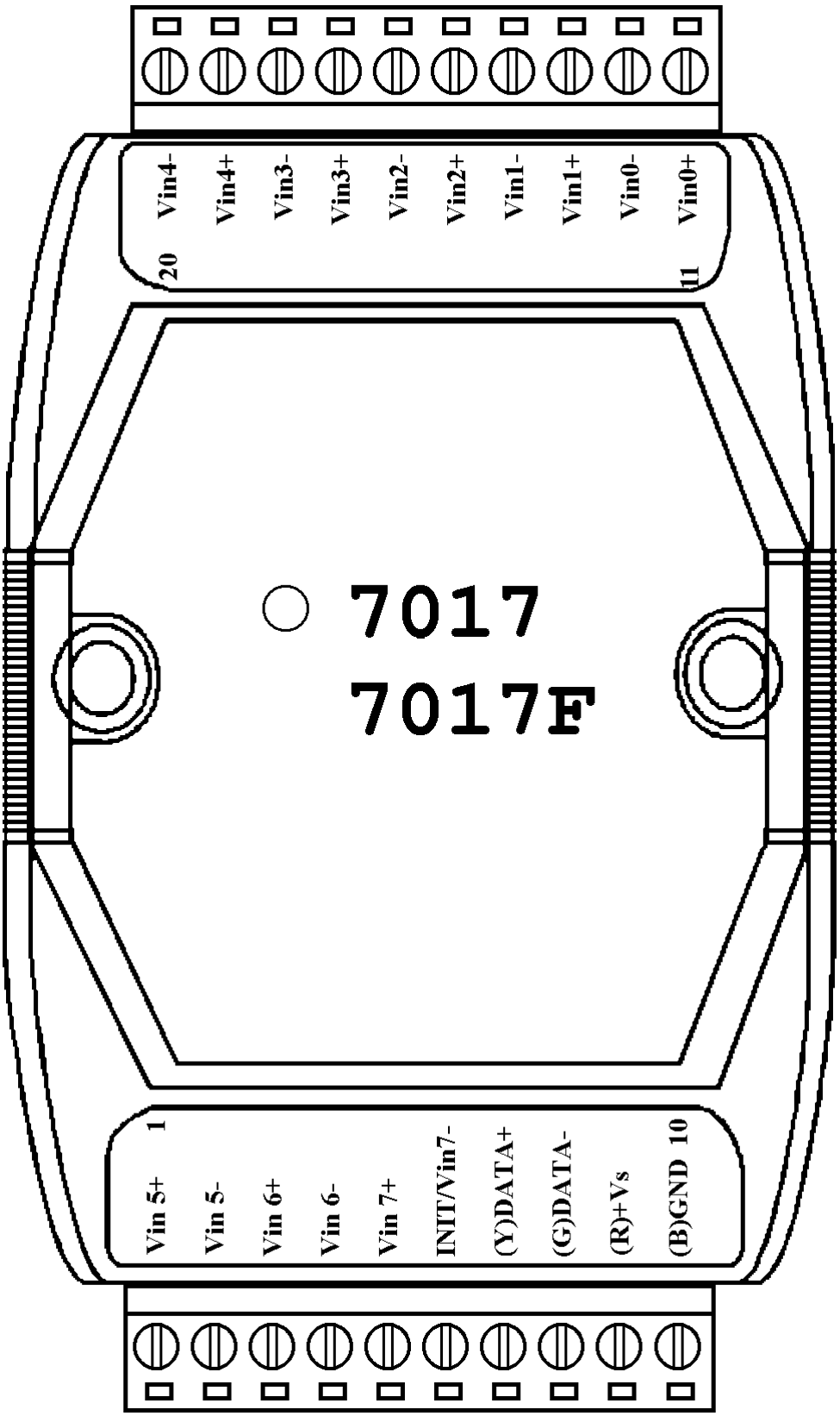
Refer to "**CB-7000 Bus Converter User Manual**" Chapter 1 for more information as following:

1.1 CB-7000 Overview
1.2 CB-7000 Related Documentation
1.3 CB-7000 Command Features
1.4 CB-7000 System Network Configuration
1.5 CB-7000 Dimension

1.2 Pin Assignments




20 DO1/HI
DI0/EV
DO0/LO
+15Vout
Vin-
Vin+
11
7014D
+15Vout 1
Iin+
Iin-
INIT*
(Y)DATA+
(G)DATA-
(R)+Vs
(B)GND 10


Vin4-
Vin4+
Vin3-
Vin3+
Vin2-
Vin2+
Vin1-
Vin1+
Vin0-
Vin0+
20
11
7017
7017F
1
Vin 5+
Vin 5-
Vin 6+
Vin 6-
Vin 7+
INIT/Vin7-
(Y)DATA+
(G)DATA-
(R)+Vs
(B)GND
10

1.3 Specifications

CB-7012/CB-7012D

Analog Input

Input Channels: 1

Input Type:

mV, V, mA (with external 125 ohms resistor)

Sampling Rate:

10 Samples/Second

Bandwidth: 5.24 Hz

Accuracy: ±0.05%

Zero Drift: 20µV/°C

Span Drift: 25ppm/°C

CMRR: 86 dB

Input Impedance: 20 MOhms

Isolation: 3000VDC

Digital Output

Output Channels: 2

Open Collector to 30V

Output Load: sink 30 mA max

Power Dissipation: 300 mW

Digital Input

Input Channel: 1

Logic Level 0: +1V max

Logic Level 1: +3.5 to 30V

Event Counter

Max Input Frequency: 50 Hz

Min. Pulse Width: 1 ms

Displayed LED

4½ digits (for CB-7012D)

Power Supply

Input: +10 to +30VDC

Consumption:

1.3W for CB-7012

1.9W for CB-7012D

CB-7012F/CB-7012FD

Analog Input

Input Channel: 1

Input Type:

mV, V, mA (with external 125 ohms resistor)

Fast Mode Sampling Rate:

100 Samples/Second

Fast Mode Bandwidth: 52.4 Hz

Fast Mode Accuracy: ±0.25%

Normal Mode:

Same as CB-7012

Input Impedance: 20 MOhms

Isolation: 3000VDC

Digital Input/Output

Same as CB-7012

Displayed LED

4½ digits (for CB-7012FD)

Power Supply

Input: +10 to +30VDC

Consumption:

1.3 W for CB-7012F

1.9 W for CB-7012FD

CB-7014D

Analog Input

Input Channel and Type:

1 Voltage Input: mV, V

1 Current Input: mA

Sampling Rate:

10 Samples/Second

Bandwidth: 5.24 Hz

Accuracy: ±0.05%

Zero Drift: 20µV/°C

Span Drift: 25ppm/°C

CMRR@50/60Hz: 150 dB min

Input Impedance:

Voltage Input: 30 KOhms

Current Input: 125 Ohms

Isolation: 3000VDC

Excitation Voltage Output

Output Rating: 30 mA@15V

Digital Input/Output

Same as CB-7012

Displayed LED

4½ digits

Power Supply

Input: +10 to +30VDC

Consumption: 1.9 W

CB-7017

Analog Input

Input Channel:

8 differential or 6 differential and 2 single-ended by jumper selection.

Analog Input Type:

mV, V, mA (with external 125 ohms resistor)

Sampling Rate:

10 Samples/Second

Bandwidth: 15.7 Hz

Accuracy: ±0.1%

Zero Drift: 20µV/°C

Span Drift: 25ppm/°C

CMRR: 86dB

Input Impedance: 20 MOhms

Overvoltage Protection: ±35V

Isolation: 3000VDC

Power Supply

Input: +10 to +30VDC

Consumption: 1.3 W

CB-7017F

Analog Input

Input Channel:

8 differential or 6 differential and 2 single-ended by jumper selection.

Analog Input Type:

mV, V, mA (with external 125 ohms resistor)

Fast Mode Sampling Rate:

75 Samples/Second

Fast Mode Bandwidth: 78.7 Hz

Fast Mode Accuracy: ±0.5%

Normal Mode:

Same as CB-7017

Input Impedance: 20M Ohms

Overvoltage Protection: ±35V

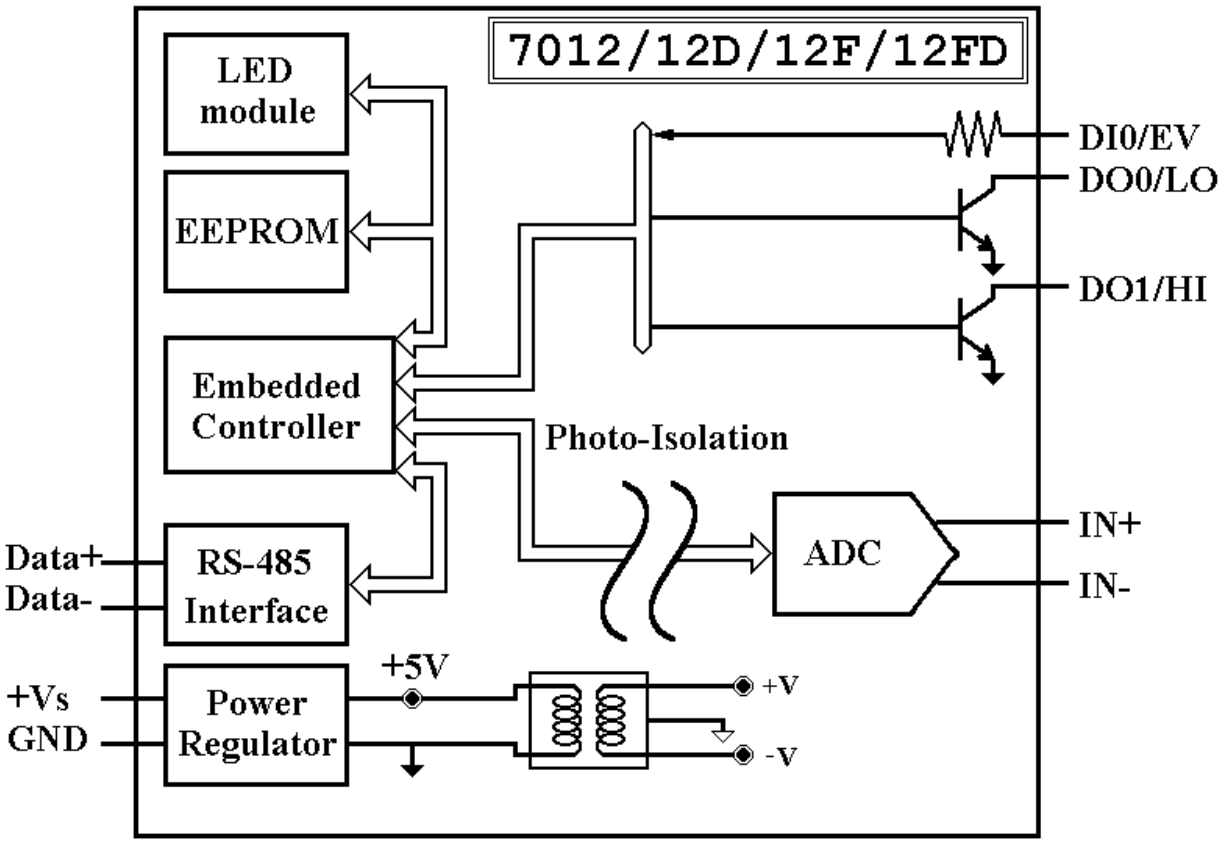
Isolation: 3000VDC

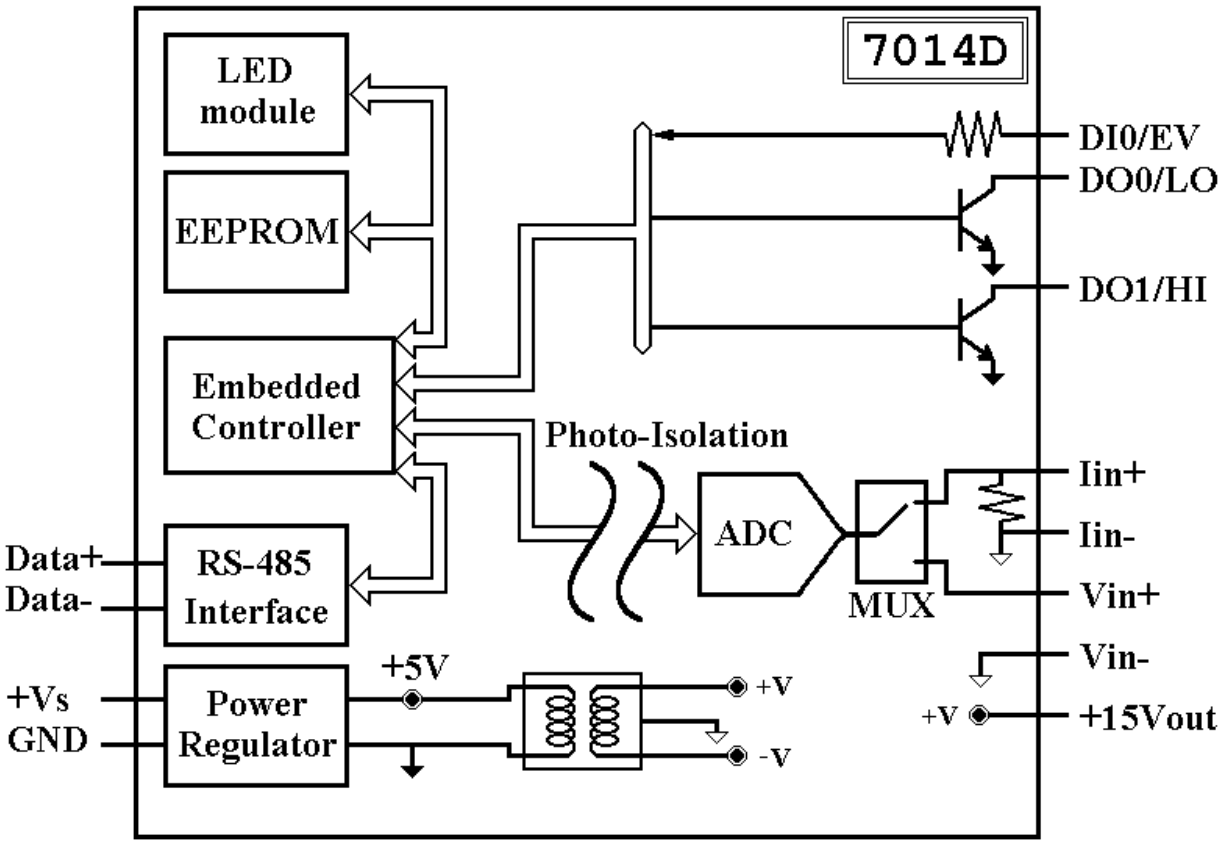
Power Supply

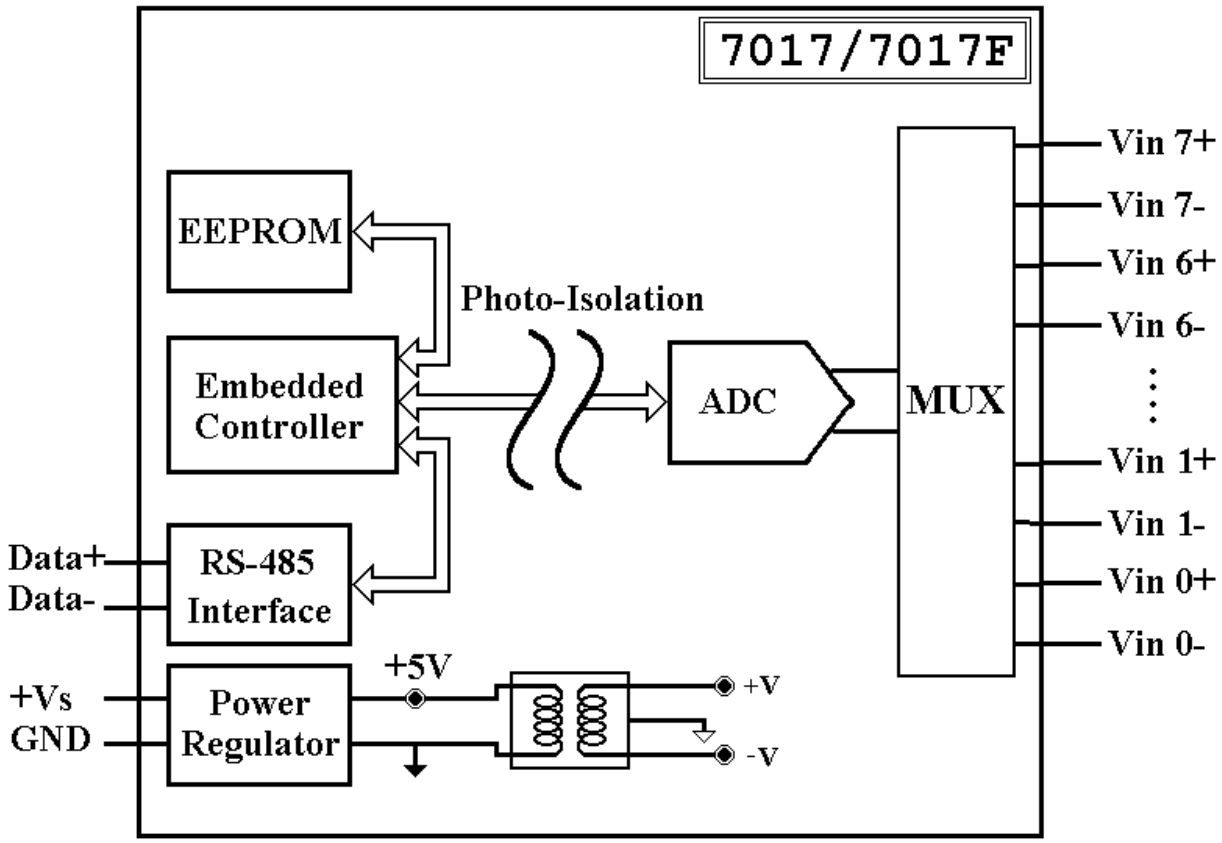
Input: +10 to +30VDC

Consumption: 1.3 W

1.4 Functional Block Diagrams

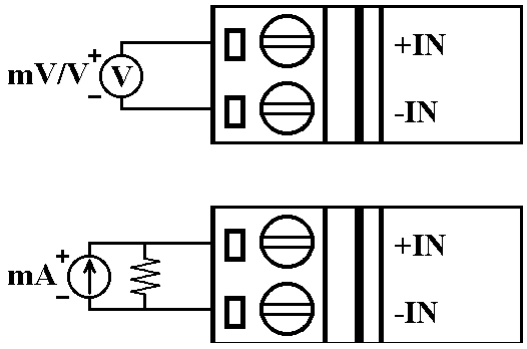




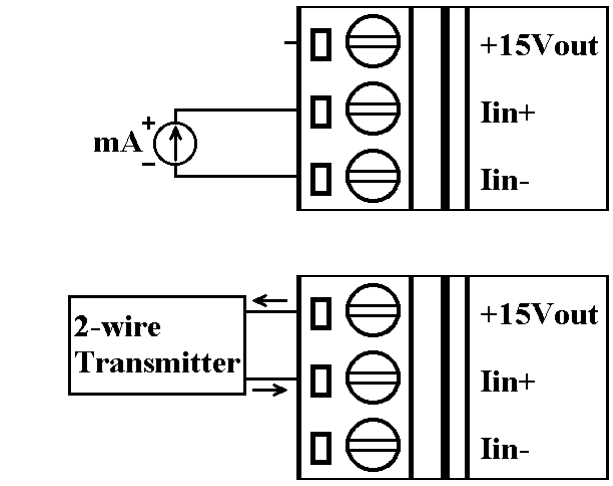

7017/7017F
EEPROM
Photo-Isolation
Embedded Controller
ADC
MUX
Vin 7+
Vin 7-
Vin 6+
Vin 6-
Vin 1+
Vin 1-
Vin 0+
Vin 0-
Data+
Data-
RS-485 Interface
+5V
+Vs
GND
Power Regulator
+V
-V

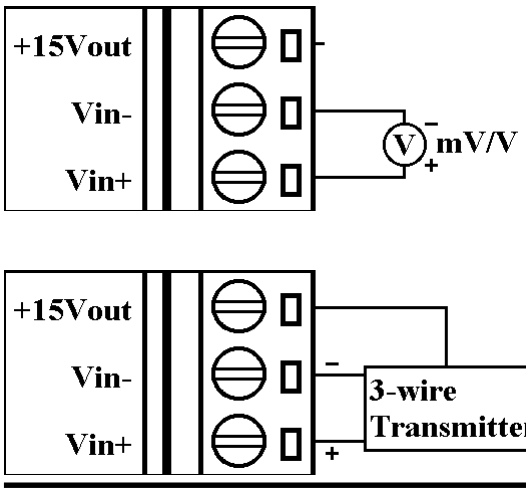
1.5 Connections

CB-7012/12D/12F/12FD
Analog Input Wire Connection

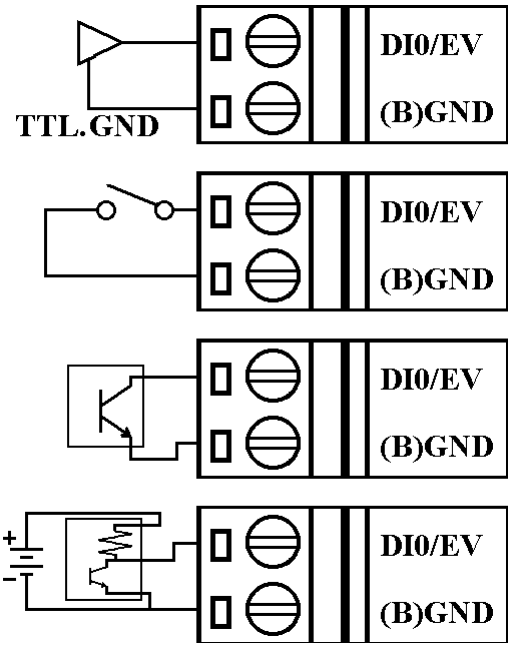


CB-7014D Analog Input Wire Connection

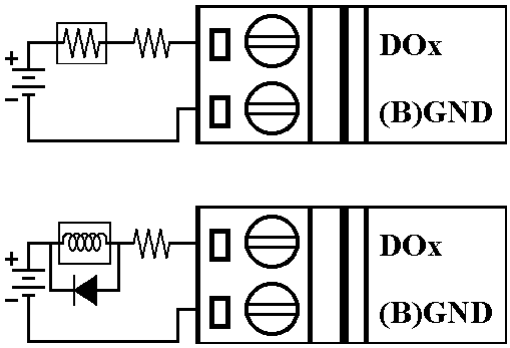




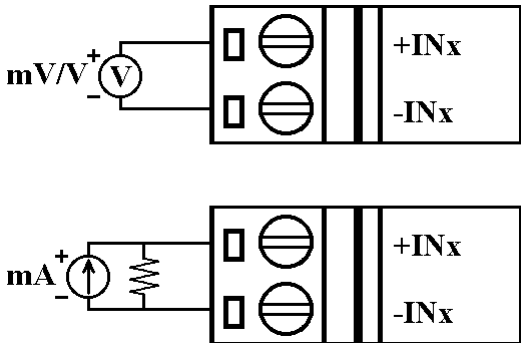
CB-7012/12D/12F/12FD/14D
Digital Input Wire Connection



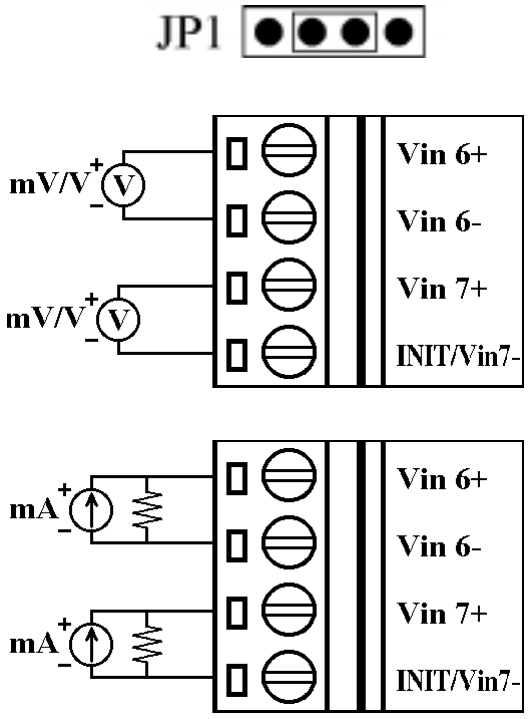
CB-7012/12D/12F/12FD/14D
Digital Output Wire Connection



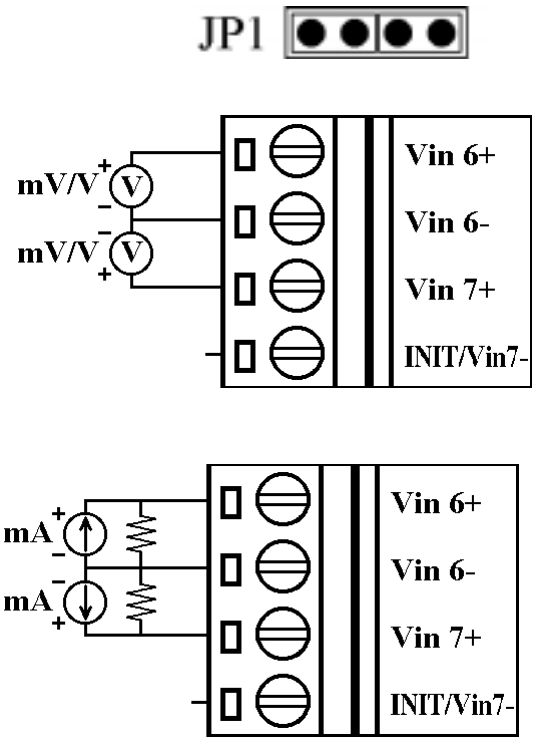
CB-7017/17F Analog Input Channel 0 to 5 Wire Connection



CB-7017/17F Analog Input Channel 6 and 7 Wire Connection, when the jumper JP1 setting is 8 differential mode.



CB-7017/17F Analog Input Channel 6 and 7 Wire Connection, when the jumper JP1 setting is INIT* mode. (Remove cover to gain access to jumper JP1.)



1.6 Quick Start

Refer to "**CB-7000 Bus Converter User Manual**" and "**Getting Started**" for more details.

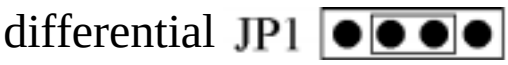
1.7 Default Setting

Default setting for CB-7012/12D/12F/12FD/14D/17/17F:

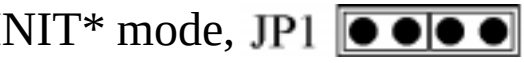
- Address: 01
- Analog Input Type: Type 08, –10 to +10 V
- Baud rate: 9600 bps
- 60 Hz filter rejection, Checksum disable, eng. unit format
- CB-7017/17F set as 6 differential and 2 single-ended modes
- CB-7012F and CB-7017F set as Fast Mode

1.8 Jumper Setting

CB-7017/17F: Jumper JP1 for select the pin INIT*/Vin 7-

Select 8 differential 

INIT*/Vin7- is set to Vin7-

Select INIT* mode, 

Vin7- is set to INIT*

1.9 Calibration

Don't Perform Calibration Until You Understand Procedure.

Calibration requirements for CB-7012/12D/12F/12FD/14D/17/17F:

When calibrating type 0D for CB-7012/12D/12F/12FD/17/17F, connect external shunt resistor, 125 ohms, 0.1% (Ref. *Sec. 1.5*).

Type Code	08	09	0A	0B	0C	0D
Zero Input	0 V	0 V	0 V	0 mV	0 mV	0 mA
Span Input	+10 V	+5 V	+1 V	+500 mV	+150 mV	+20 mA

Calibration Sequence:

1. Connect calibration voltage/current to module's input. For CB-7017/17F, connect to channel 0. (To connect, see *Sec. 1.5)*
2. Warm-Up for 30 minutes.
3. Set Type to 08. -> See *Sec. 2.1.*
4. Enable Calibration. -> See *Sec. 2.18.*
5. Apply Zero Calibration Voltage.
6. Perform Zero Calibration Command. See *Sec. 2.6.*
7. Apply "Span Input" Calibration Voltage.
8. Perform Span Calibration Command. See *Sec. 2.5.*
9. Repeat step 4 to step 8 three times.

1.10 Configuration Tables

Configuration Table for CB-7012/12F/12D/12FD/14D/17/17F:

Baud rate Setting (CC)

Code	03	04	05	06	07	08	09	0A
Baudrate	1200	2400	4800	9600	19200	38400	57600	115200

Analog Input Type Setting (TT)

Type Code	08	09	0A	0B	0C	0D
Min. Input	-10 V	-5 V	-1 V	-500 mV	-150 mV	-20 mA
Max Input	+10 V	+5 V	+1 V	+500 mV	+150 mV	+20 mA

Data Format Setting (FF)

7	6	5	4	3	2	1	0
*1	*2	*3	0	0	0	*4	

*1: 0 = 60 Hz rejection
1 = 50 Hz rejection

*2: Checksum Bit: 0 = Disable, 1 = Enable

*3: Fast/Normal Bit: 0 = Normal, 1 = Fast
(For CB-7012F/12FD/17F only)

*4: 00 = Engineering Unit Format
01 = Percent Format
10 = 2’s Complement HEX Format

Analog input type and data format table

Type Code	Input Range	Data Format	+F.S.	Zero	-F.S.
08	-10 to +10 V	Engineer Unit	+10.000	+00.000	-10.000
		% of FSR	+100.00	+000.00	-100.00
		2's complement HEX	7FFF	0000	8000
09	-5 to +5 V	Engineer Unit	+5.0000	+0.0000	-5.0000
		% of FSR	+100.00	+000.00	-100.00
		2's complement HEX	7FFF	0000	8000
0A	-1 to +1 V	Engineer Unit	+1.0000	+0.0000	-1.0000
		% of FSR	+100.00	+000.00	-100.00
		2's complement HEX	7FFF	0000	8000
0B	-500 to +500 mV	Engineer Unit	+500.00	+000.00	-500.00
		% of FSR	+100.00	+000.00	-100.00
		2's complement HEX	7FFF	0000	8000
0C	-150 to +150 mV	Engineer Unit	+150.00	+000.00	-150.00
		% of FSR	+100.00	+000.00	-100.00
		2's complement HEX	7FFF	0000	8000
0D	-20 to +20 mA	Engineer Unit	+20.000	+00.000	-20.000
		% of FSR	+100.00	+000.00	-100.00
		2's complement HEX	7FFF	0000	8000

2. Commands

Command Format: **(Delimiter)(Address)(Command)[CHK](cr)**

Response Format: **(Delimiter)(Address)(Data)[CHK](cr)**

[CHK] 2-character checksum

(cr) end-of-command character, character return (0x0D)

General Command Sets			
Command	**Response**	**Description**	**Section**
%AANNTTCCFF	!AA	Set Module Configuration	***Sec.2.1***
#**	No Response	Synchronized Sampling	***Sec.2.2***
#AA	>(Data)	Read Analog Input	***Sec.2.3***
#AAN	>(Data)	Read Analog Input from channel N	***Sec.2.4***
$AA0	!AA	Perform Span Calibration	***Sec.2.5***
$AA1	!AA	Perform Zero Calibration	***Sec.2.6***
$AA2	!AANNTTCCFF	Read Configuration	***Sec.2.7***
$AA4	>AAS(Data)	Read Synchronized Data	***Sec.2.8***
$AA5VV	!AA	Set Channel Enable	***Sec.2.9***
$AA6	!AAVV	Read Channel Status	***Sec.2.10***
$AA8	!AAV	Read LED Configuration	***Sec.2.11***
$AA8V	!AA	Set LED Configuration	***Sec.2.12***
$AA9(Data)	!AA	Set LED Data	***Sec.2.13***
$AAA	!(Data)	Read 8 channel data	***Sec.2.14***
$AAF	!AA(Data)	Read Firmware Version	***Sec.2.15***
$AAM	!AA(Data)	Read Module Name	***Sec.2.16***
~AAO(Data)	!AA	Set Module Name	***Sec.2.17***
~AAEV	!AA	Enable/Disable Calibration	***Sec.2.18***

Digital Input/Output, Alarm and Event Counter Command Sets			
Command	**Response**	**Description**	**Section**
@AADI	!AASOOII	Read Digital I/O and Alarm Status	***Sec.2.19***
@AADO(Data)	!AA	Set Digital Output	***Sec.2.20***
@AAEAT	!AA	Enable Alarm	***Sec.2.21***
@AAHI(Data)	!AA	Set High Alarm	***Sec.2.22***
@AALO(Data)	!AA	Set Low Alarm	***Sec.2.23***
@AADA	!AA	Disable Alarm	***Sec.2.24***
@AACA	!AA	Clear Latch Alarm	***Sec.2.25***
@AARH	!AA(Data)	Read High Alarm	***Sec.2.26***
@AARL	!AA(Data)	Read Low Alarm	***Sec.2.27***
@AARE	!AA(Data)	Read Event Counter	***Sec.2.28***
@AACE	!AA	Clear Event Counter	***Sec.2.29***

Linear Mapping Command Sets			
Command	**Response**	**Description**	**Section**
$AA3	!AA(SL)(SH)	Read Source Low/High Values for Linear Mapping	***Sec.2.30***
$AA5	!AA(TL)(TH)	Read Target Low/High Values for Linear Mapping	***Sec.2.31***
$AA6(SL)(SH)	!AA	Set Source Low/High Values for Linear Mapping	***Sec.2.32***
$AA7(TL)(TH)	!AA	Set Target Low/High Values for Linear Mapping	***Sec.2.33***
$AAA	!AAV	Read Linear Mapping Status	***Sec.2.34***
$AAAV	!AA	Enable/Disable Linear Mapping	***Sec.2.35***

Host Watchdog Related Command Sets			
Command	**Response**	**Description**	***Section***
~**	No Response	Host OK	***Sec.2.36***
~AA0	!AASS	Read Module Status	***Sec.2.37***
~AA1	!AA	Reset Module Status	***Sec.2.38***
~AA2	!AAVV	Read Host Watchdog Timeout Interval	***Sec.2.39***
~AA3EVV	!AA	Set Host Watchdog Timeout Interval	***Sec.2.40***
~AA4	!AAPPSS	Read PowerOn Value and Safe Value	***Sec.2.41***
~AA5PPSS	!AA	Set PowerOn Value and Safe Value	***Sec.2.42***

2.1 %AANNTTCCFF

Description: Set Module Configuration

Syntax: %AANNTTCCFF[CHK](cr)

% a Delimiter character

AA Address of module to set (00 to FF)

NN new Address for module to set (00 to FF)

TT new type for module to set (Ref. *Sec. 1.10*)

CC new baudrate for receiving module (Ref. *Sec. 1.10*). Short INIT* to ground when changing baudrate. (Ref. *Sec. 3.1*)

FF New data format for module (Ref. *Sec. 1.10*). Short INIT* to ground when changing checksum setting. (Ref. *Sec. 3.1*)

Response: Valid Command: **!AA[CHK](cr)**

Invalid Command: **?AA[CHK](cr)**

Syntax or communication error may get no response.

! Delimiter for valid command

? Delimiter for invalid command. If you change baud rate or checksum setting without shorting INIT* to ground, the module will return an invalid command.

AA Address of responding module (00 to FF)

Example:

Command: %0102080600 Receive: !02

Change Address from 01 to 02, return successful.

Command: %0202080602 Receive: !02

Change data format from 00 to 02, return successful.

Related Command:

Sec. 2.7 $AA2

Related Topics:

Sec. 1.10, Configuration Tables; *Sec. 3.1,* INIT* pin Operation

2.2 #**

Description: Synchronized Sampling

Note: This command is for CB-7012/12D/12F/12FD/14D only.

Syntax: #[CHK](cr)**

a Delimiter character

** synchronized sampling command

Response: No response

Example:

Command: #** No response

Send synchronized sampling command.

Command: $014 Receive: >011+025.123

First read, get status = 1.

Command: $014 Receive: >010+025.123

Second read, get status = 0.

Related Command:

Sec. 2.8 $AA4

2.3 #AA

Description: Read Analog Input

Syntax: #AA[CHK](cr)

#	Delimiter character
AA	Address of module (00 to FF)

Response: Valid Command: **>(Data)[CHK](cr)**

Syntax or communication error may get no response.

>	Delimiter for valid command
(Data)	Analog input value, reference *Sec. 1.10* for its format When using #AA command to CB-7017/17F, the data is the combination for each channel respectively.

Example:

Command: #01 Receive: >+02.635

Read Address 01, get data successful.

Command: #02 Receive: >4C53

Read Address 02, get data in HEX format successfully.

Command: #04

Receive: >+05.123+04.153+07.234-02.356+10.000-
05.133+02.345+08.234

The module Address 04 is CB-7017. Read Address 04 to get data from all eight channels.

Related Command:

Sec. 2.1, %AANNTTCCFF; *Sec. 2.7*, $AA2

Related Topics:

Sec. 1.10, Configuration Tables

2.4 #AAN

Description: Read Analog Input from channel N

Note: This command is for CB-7017/17F only.

Syntax: #AAN[CHK](cr)

#	Delimiter character
AA	Address for module (00 to FF)
N	channel to read, from 0 to 7

Response: Valid Command: **>(Data)[CHK](cr)**

Invalid Command: **?AA[CHK](cr)**

Syntax or communication error may get no response.

>	Delimiter for valid command
?	Delimiter for invalid command
AA	Address of responding module (00 to FF)
(Data)	analog input value; see *Sec. 1.10* for its format

Example:

Command: #032 Receive: >+02.513

Read Address 03 channel 2, get data successfully.

Command: #029 Receive: ?02

Read Address 02 channel 9, return error channel number.

Related Command:

Sec. 2.1 %AANNTTCCFF, *Sec. 2.7* $AA2

Related Topics:

Sec. 1.10 Configuration Tables

2.5 $AA0

Description: Perform Span Calibration

Syntax: $AA0[CHK](cr)

$ Delimiter character

AA Address of module to set (00 to FF)

0 Command for performing span calibration

Response: Valid Command: **!AA[CHK](cr)**

Invalid Command: **?AA[CHK](cr)**

Syntax or communication error may get no response.

! Delimiter for valid command

? Delimiter for invalid command

AA Address of responding module (00 to FF)

Example:

Command: $010 Receive: !01

Perform Address 01 span calibration, return successful.

Command: $020 Receive: ?02

Perform Address 02 span calibration; return calibration not enabled before performing calibration command.

Related Command:

Sec. 2.6 $AA1, *Sec. 2.18* ~AAEV

Related Topics:

Sec. 1.9 Calibration

2.6 $AA1

Description: Perform Zero Calibration

Syntax: $AA1[CHK](cr)

$ Delimiter character

AA Address of module to set (00 to FF)

1 Command for performing zero calibration

Response: Valid Command: **!AA[CHK](cr)**

Invalid Command: **?AA[CHK](cr)**

Syntax or communication error may get no response.

! Delimiter for valid command

? Delimiter for invalid command

AA Address of responding module (00 to FF)

Example:

Command: $011 Receive: !01

Perform Address 01 zero calibration, return successful.

Command: $021 Receive: ?02

Perform Address 02 zero calibration; returns calibration not enabled before performing calibration command.

Related Command:

Sec. 2.5, $AA0; *Sec. 2.18* ~AAEV

Related Topics:

Sec. 1.9 Calibration

2.7 $AA2

Description: Read Configuration

Syntax: $AA2[CHK](cr)

$ Delimiter character

AA Address of module (00 to FF)

2 Command for reading configuration

Response: Valid Command:

!AATTCCFF[CHK](cr)

Invalid Command: **?AA[CHK](cr)**

Syntax or communication error may get no response.

! Delimiter for valid command

? Delimiter for invalid command

AA Address of responding module (00 to FF)

TT Type code of module (reference *Sec. 1.10*)

CC Baud rate code of module (reference *Sec. 1.10*)

FF Data format of module (reference *Sec. 1.10*)

Example:

Command: $012 Receive: !01080600

Read Address 01 configuration, return successful.

Command: $022 Receive: !020A0602

Read Address 02 configuration, return successful.

Related Command:

Sec. 2.1 %AANNTTCCFF

Related Topics:

Sec. 1.10, Configuration Tables; *Sec. 3.1,* INIT* pin Operation

2.8 $AA4

Description: Read Synchronized Data

Syntax: $AA4[CHK](cr)

$	Delimiter character
AA	Address of module (00 to FF)
4	Command for reading synchronized data

Response: Valid Command: **>AAS(Data)[CHK](cr)**

Invalid Command: **?AA[CHK](cr)**

Syntax or communication error may get no response.

!	Delimiter for valid command
?	Delimiter for invalid command
AA	Address of responding module (00 to FF)
S	Status of synchronized data, 1 = first read, 0 = been read
(Data)	Synchronized data, format reference *Sec. 1.10*

Example:

Command: $014 Receive: ?01

Read Address 01 synchronized data, return no valid data.

Command: #** Receive: no response

Preform synchronized sampling

Command: $014 Receive: >011+02.556

Read Address 01 synchronized data, return status 1 and data.

Command: $014 Receive: >010+02.556

Read Address 01 synchronized data, return status 0 and data.

Related Command:

*Sec. 2.2, #***

Note: This command is for CB-7012/12D/12F/12FD/14D only.

2.9 $AA5VV

Description: Set Channel Enable

Note: This command is for CB-7017/17F only.

Syntax: $AA5VV[CHK](cr)

$ Delimiter character

AA Address of module to set (00 to FF)

5 Command to set channel enable

VV channel enable/disable, 00 is all disabled and FF is all enabled.

Response: Valid Command: **!AA[CHK](cr)**

Invalid Command: **?AA[CHK](cr)**

Syntax or communication error may get no response.

! Delimiter for valid command

? Delimiter for invalid command

AA Address of responding module (00 to FF)

Example:

Command: $0155A Receive: !01

Set Address 01 to enable channel 1,3,4,6 and disable channel 0,2,5,7. Return successful.

Command: $016 Receive: !015A

Read Address 01 channel status. Return channel 1,3,4,6 are enabled and channel 0,2,5,7 are disabled.

Related Command:

Sec. 2.10 $AA6

2.10 $AA6

Description: Read Channel Status

Note: The command is for CB-7017/17F only.

Syntax: $AA6[CHK](cr)

$	Delimiter character
AA	Address of module (00 to FF)
6	Command for read channel status

Response: Valid Command: **!AAVV[CHK](cr)**

Invalid Command: **?AA[CHK](cr)**

Syntax or communication error may get no response.

!	Delimiter for valid command
?	Delimiter for invalid command
AA	Address of responding module (00 to FF)
VV	channel enable/disable; 00 is all-disabled and FF is all-enabled.

Example:

Command: $015A5 Receive: !01

Set Address 01 to enable channel 0,2,5,7 and disable channel 1,3,4,6. Return successful.

Command: $016 Receive: !01A5

Read Address 01 channel status. Return channel 0,2,5,7 are enabled and channel 1,3,4,6 are disabled.

Related Command:

Sec. 2.9 $AA5VV

2.11 $AA8

Description: Read LED Configuration

Note: The command is for CB-7012D/12FD/14D only.

Syntax: $AA8[CHK](cr)

$	Delimiter character
AA	Address of module (00 to FF)
8	Command for reading LED configuration

Response: Valid Command: **!AAV[CHK](cr)**

Invalid Command: **?AA[CHK](cr)**

Syntax or communication error may get no response.

!	Delimiter for valid command
?	Delimiter for invalid command
AA	Address of responding module (00 to FF)
V	LED configuration 1 = module control, 2 = host control

Example:

Command: $018 Receive: !011

Read Address 01 LED configuration, return module control.

Command: $028 Receive: !012

Read Address 02 LED configuration, return host control.

Related Command:

Sec. 2.12, $AA8V; *Sec. 2.13*, $AA9(Data)

2.12 $AA8V

Description: Set LED Configuration

Note: The command is for CB-7012D/12FD/14D only.

Syntax: $AA8V[CHK](cr)

$	Delimiter character
AA	Address of module to set (00 to FF)
8	Command for setting LED configuration
V	1=Set LED to module, 2=Set LED to host

Response: Valid Command: **!AA[CHK](cr)**

Invalid Command: **?AA[CHK](cr)**

Syntax or communication error may get no response.

!	Delimiter for valid command
?	Delimiter for invalid command
AA	Address of responding module (00 to FF)

Example:

Command: $0182 Receive: !01

Set Address 01 LED to host control, return successful.

Command: $0281 Receive: !02

Set Address 02 LED to module control, return successful.

Related Command:

Sec. 2.11, $AA8; *Sec. 2.13*, $AA9(Data)

2.13 $AA9(Data)

Description: Set LED Data

Note: This command is for CB-7012D/12FD/14D only.

Syntax: $AA9(Data)[CHK](cr)

$	Delimiter character
AA	Address of module to set (00 to FF)
9	Command for setting LED data
(Data)	Data for show on the LED, from -19999. to +19999. The data format is a sign, 5 numerals and a decimal point.

Response: Valid Command: **!AA[CHK](cr)**

Invalid Command: **?AA[CHK](cr)**

Syntax or communication error may get no response.

!	Delimiter for valid command
?	Delimiter for invalid command or LED not set to host control.
AA	Address of responding module (00 to FF)

Example:

Command: $019+123.45 Receive: !01

Send Address 01 LED data +123.45, return successful.

Command: $029+512.34 Receive: ?02

Send Address 02 LED data +512.34; returns that the LED is not set in the host mode.

Related Command:

Sec. 2.11 $AA8, *Sec. 2.12* $AA8V

2.14 $AAA

Description: Read eight channel of data

Note: The command is for CB-7017/17F only.

Syntax: $AAA[CHK](cr)

$ Delimiter character

AA Address of module (00 to FF)

A Command for reading eight channels of analog input data

Response: Valid Command:

>(Data1)..(Data8)[CHK](cr)

Invalid Command: **?AA[CHK](cr)**

Syntax or communication error may get no response.

! Delimiter for valid command

? Delimiter for invalid command

AA Address of responding module (00 to FF)

(Data1)...(Data8) 8 channel analog input data, in 2's complement HEX format.

Example:

Command: $01A

Receive: >0000012301257FFF1802744F98238124

Read Address 01 8-channel analog input data, return successful.

Related Command:

Sec. 2.3, #AA

2.15 $AAF

Description: Read Firmware Version

Syntax: $AAF[CHK](cr)

$	Delimiter character
AA	Address of module (00 to FF)
F	Command for read firmware version

Response: Valid Command: **!AA(Data)[CHK](cr)**

Invalid Command: **?AA[CHK](cr)**

Syntax or communication error may get no response.

!	Delimiter for valid command
?	Delimiter for invalid command
AA	Address of responding module (00 to FF)
(Data)	firmware version of module

Example:

Command: $01F Receive: !01A2.0

Read Address 01 firmware version, return version A2.0.

Command: $02F Receive: !01B1.1

Read Address 02 firmware version, return version B1.1.

2.16 $AAM

Description: Read Module Name

Syntax: $AAM[CHK](cr)

$	Delimiter character
AA	Address of module (00 to FF)
M	Command for read module name

Response: Valid Command: **!AA(Data)[CHK](cr)**

Invalid Command: **?AA[CHK](cr)**

Syntax or communication error may get no response.

!	Delimiter for valid command
?	Delimiter for invalid command
AA	Address of responding module (00 to FF)
(Data)	Name of module

Example:

Command: $01M Receive: !017012

Read Address 01 module name, return name 7012.

Command: $03M Receive: !037014D

Read Address 03 module name, return name 7014D.

Related Command:

Sec. 2.17, ~AAO(Data)

2.17 ~AAO(Data)

Description: Module to set Name

Syntax: ~AAO(Data)[CHK](cr)

~	Delimiter character
AA	Address of module to set (00 to FF)
O	Command to set module name
(Data)	new name for module, max 6 characters

Response: Valid Command: **!AA[CHK](cr)**

Invalid Command: **?AA[CHK](cr)**

Syntax or communication error may get no response.

!	Delimiter for valid command
?	Delimiter for invalid command
AA	Address of responding module (00 to FF)

Example:

Command: ~01O7012 Receive: !01

Set Address 01 module name to 7012, return successful.

Command: $01M Receive: !017012

Read Address 01 module name, return 7012.

Related Command:

Sec. 2.16, $AAM

2.18 ~AAEV

Description: Enable/Disable Calibration

Syntax: ~AAEV[CHK](cr)

~ Delimiter character

AA Address of module to set (00 to FF)

E Command to enable/disable calibration

V 1=Enable/0=Disable calibration

Response: Valid Command: **!AA[CHK](cr)**

Invalid Command: **?AA[CHK](cr)**

Syntax or communication error may get no response.

! Delimiter for valid command

? Delimiter for invalid command

AA Address of responding module (00 to FF)

Example:

Command: $010 Receive: ?01

Perform Address 01 span calibration, returns the command is invalid before enabling calibration.

Command: ~01E1 Receive: !01

Set Address 01 to enable calibration, return successful.

Command: $010 Receive: !01

Preform Address 01 span calibration, return successful.

Related Command:

Sec. 2.5, $AA0, *Sec. 2.6,* $AA1

Related Topic:

Sec. 1.9, Calibration

2.19 @AADI

Description: Read Digital I/O and Alarm Status

Note: This command is for CB-7012/12D/12F/12FD/14D only.

Syntax: @AADI[CHK](cr)

@ Delimiter character

AA Address of module (00 to FF)

DI Command for reading digital input and alarm status

Response: Valid Command: **!AASOOII[CHK](cr)**

Invalid Command: **?AA[CHK](cr)**

Syntax or communication error may get no response.

! Delimiter for valid command

? Delimiter for invalid command

AA Address of responding module (00 to FF)

S alarm enable status, 0=alarm disable, 1=momentary alarm enabled, 2=latch alarm enabled.

OO digital output status; 00=DO0 off, DO1 off, 01=DO0 on, DO1 off, 02=DO0 off, DO1 on, 03=OD0 on, DO1 on.

II digital input status, 00=input low, 01=input high level.

Example:

Command: @01DI Receive: !0100001

Read Address 01 digital input, return alarm disable, digital output all off, and digital input high level.

Related Command:

Sec. 2.20, @AADO(Data); *Set. 2.21*, @AAEAT; *Sec. 2.24,* @AADA

Related Topic:

Sec. 3.4, Digital Input and Event Counter; *Sec. 3.5*, Digital Output

2.20 @AADO(Data)

Description: Set Digital Output

Note: This command is for CB-7012/12D/12F/12FD/14D only.

Syntax: @AADO(Data)[CHK](cr)

@	Delimiter character
AA	Address of module to set (00 to FF)
DO	Command for set digital output
(Data)	output value, 00=DO0 off, DO1 off, 01=DO0 on, DO1 off, 02=DO0 off, DO1 on, 03=DO0 on, DO1 on

Response: Valid Command: **!AA[CHK](cr)**

Invalid Command: **?AA[CHK](cr)**

Syntax or communication error may get no response.

!	Delimiter for valid command
?	Delimiter for invalid command. When the alarm is enabled, the command will return invalid.
AA	Address of responding module (00 to FF)

Example:

Command: @01DO00 Receive: !01

Set Address 01 digital output 00, return successful.

Related Command:

Sec. 2.19, @AADI; *Sec. 2.21*, @AAEAT; *Sec. 2.24*, @AADA

Related Topic:

Sec. 3.5, Digital Output

2.21 @AAEAT

Description: Enable Alarm

Note: This command is for CB-7012/12D/12F/12FD/14D only.

Syntax: @AAEAT[CHK](cr)

@ Delimiter character

AA Address of receiving module (00 to FF)

EA Command to enable alarm.

T Alarm type, M=momentary alarm, L=latch alarm.

Response: Valid Command: **!AA[CHK](cr)**

Invalid Command: **?AA[CHK](cr)**

Syntax or communication error may get no response.

! Delimiter for valid command

? Delimiter for invalid command

AA Address of responding module (00 to FF)

Example:

Command: @01EAM Receive: !01

Set Address 01 momentary alarm; return successful.

Related Command:

Sec. 2.19, @AADI; *Sec. 2.24,* @AADA; *Sec. 2.25* @AACA

Related Topic:

Sec. 3.6, High/Low Alarm

2.22 @AAHI(Data)

Description: Set High Alarm

Note: This command is for CB-7012/12D/12F/12FD/14D only.

Syntax: @AAHI(Data)[CHK](cr)

@	Delimiter character
AA	Address of module to set (00 to FF)
HI	Command to set high alarm value
(Data)	high alarm values, data format is engineering units.

Response: Valid Command: **!AA[CHK](cr)**

Invalid Command: **?AA[CHK](cr)**

Syntax or communication error may get no response.

!	Delimiter for valid command
?	Delimiter for invalid command
AA	Address of responding module (00 to FF)

Example:

Command: @01HI+10.000 Receive: !01

Set Address 01 high alarm +10.000; return successful.

Related Command:

Sec. 2.21, @AAEAT; *Sec. 2.26,* @AARH

Related Topic:

Sec. 3.6, High/Low Alarm

2.23 @AALO(Data)

Description: Set Low Alarm

Note: This command is for CB-7012/12D/12F/12FD/14D only.

Syntax: @AALO(Data)[CHK](cr)

@	Delimiter character
AA	Address of module to set (00 to FF)
LO	Command for setting low alarm value
(Data)	low alarm values, data format is in engineering units.

Response: Valid Command: **!AA[CHK](cr)**

Invalid Command: **?AA[CHK](cr)**

Syntax or communication error may get no response.

!	Delimiter for valid command
?	Delimiter for invalid command
AA	Address of responding module (00 to FF)

Example:

Command: @01LO-10.000 Receive: !01

Set Address 01 low alarm -10.000; return successful.

Related Command:

Sec. 2.21, @AAEAT; *Sec. 2.27,* @AARL

Related Topic:

Sec. 3.6, High/Low Alarm

2.24 @AADA

Description: Disable Alarm

Note: This command is for CB-7012/12D/12F/12FD/14D only.

Syntax: @AADA[CHK](cr)

@	Delimiter character
AA	Address of module to set (00 to FF)
DA	Command for disable alarm

Response: Valid Command: **!AA[CHK](cr)**

Invalid Command: **?AA[CHK](cr)**

Syntax or communication error may get no response.

!	Delimiter for valid command
?	Delimiter for invalid command
AA	Address of responding module (00 to FF)

Example:

Command: @01DA Receive: !01

Disable Address 01 alarm; return successful.

Related Command:

Sec. 2.21, @AAEAT

Related Topic:

Sec. 3.6, High/Low Alarm

2.25 @AACA

Description: Clear Latch Alarm

Note: This command is for CB-7012/12D/12F/12FD/14D only.

Syntax: @AACA[CHK](cr)

@ Delimiter character

AA Address of module to set (00 to FF)

CA Command for clear latch alarm

Response: Valid Command: **!AA[CHK](cr)**

Invalid Command: **?AA[CHK](cr)**

Syntax or communication error may get no response.

! Delimiter for valid command

? Delimiter for invalid command

AA Address of responding module (00 to FF)

Example:

Command: @01DI Receive: !0120101

Read Address 01 digital input, return latch alarm mode, low alarm active.

Command: @01CA Receive: !01

Clear Address 01 latch alarm, return successful.

Command: @01DI Receive: !0120001

Read Address 01 digital input, return latch alarm mode, no alarm active.

Related Command:

Sec. 2.19, @AADI; *Sec. 2.21,* @AAEAT; *Sec. 2.24,* @AADA

Related Topic:

Sec. 3.6 High/Low Alarm

2.26 @AARH

Description: Read High Alarm

Note: This command is for CB-7012/12D/12F/12FD/14D only.

Syntax: @AARH[CHK](cr)

@ Delimiter character

AA Address of module (00 to FF)

RH Command for reading high alarm

Response: Valid Command: **!AA(Data)[CHK](cr)**

Invalid Command: **?AA[CHK](cr)**

Syntax or communication error may get no response.

! Delimiter for valid command.

? Delimiter for invalid command.

AA Address of responding module (00 to FF)

(Data) high alarm value is in engineering units format.

Example:

Command: @01RH Receive: !01+10.000

Read Address 01 high alarm; return +10.000.

Related Command:

Sec. 2.22, @AAHI

Related Topic:

Sec. 3.6, High/Low Alarm

2.27 @AARL

Description: Read Low Alarm

Note: This command is for CB-7012/12D/12F/12FD/14D only.

Syntax: @AARL[CHK](cr)

@ Delimiter character

AA Address of module (00 to FF)

RL Command for reading low alarm

Response: Valid Command: **!AA(Data)[CHK](cr)**

Invalid Command: **?AA[CHK](cr)**

Syntax or communication error may get no response.

! Delimiter for valid command.

? Delimiter for invalid command.

AA Address of responding module (00 to FF)

(Data) Low alarm value is in engineering units format.

Example:

Command: @01RL Receive: !01–10.000

Read Address 01 low alarm; return –10.000.

Related Command:

Sec. 2.23, @AALO

Related Topic:

Sec. 3.6, High/Low Alarm

2.28 @AARE

Description: Read Event Counter

Note: This command is for CB-7012/12D/12F/12FD/14D only.

Syntax: @AARE[CHK](cr)

@	Delimiter character
AA	Address of module (00 to FF)
RH	Command for reading event counter

Response: Valid Command: **!AA(Data)[CHK](cr)**

Invalid Command: **?AA[CHK](cr)**

Syntax or communication error may get no response.

!	Delimiter for valid command
?	Delimiter for invalid command
AA	Address of responding module (00 to FF)
(Data)	Event counter value, from 00000 to 65535.

Example:

Command: @01RE Receive: !0101234

Read Address 01 event counter; return 1234.

Related Command:

Sec. 2.29, @AACE

Related Topic:

Sec. 3.4, Digital Input and Event Counter

2.29 @AACE

Description: Clear Event Counter

Note: This command is for CB-7012/12D/12F/12FD/14D only.

Syntax: @AACE[CHK](cr)

@ Delimiter character

AA Address of module (00 to FF)

CE Command to clear event counter

Response: Valid Command: **!AA[CHK](cr)**

Invalid Command: **?AA[CHK](cr)**

Syntax or communication error may get no response.

! Delimiter for valid command

? Delimiter for invalid command

AA Address of responding module (00 to FF)

Example:

Command: @01RE Receive: !0101234

Read Address 01 event counter; returns 1234.

Command: @01CE Receive: !01

Clear Address 01 event counter, return successful.

Command: @01RE Receive: !0100000

Read Address 01 event counter, return 0.

Related Command:

Sec. 2.28 @AARE

Related Topic:

Sec. 3.4 Digital Input and Event Counter

2.30 $AA3

Description: Read Source Low/High Values for Linear Mapping

Note: This command is for CB-7014D only.

Syntax: $AA3[CHK](cr)

$ Delimiter character

AA Address of module (00 to FF)

3 Command for reading source values

Response: Valid Command: **!AA(SL)(SH)[CHK](cr)**

Invalid Command: **?AA[CHK](cr)**

Syntax or communication error may get no response.

! Delimiter for valid command

? Delimiter for invalid command

AA Address of responding module (00 to FF)

SL Low limit of source values in engineering unit format.

SH High limit of source values in engineering unit format.

Example:

Command: $013 Receive: !01-10.000+10.000

Read Address 01 source value, return from -10 to +10.

Related Command:

Sec. 2.31, $AA5; *Sec. 2.32*, $AA6(SL)(SH); *Sec. 2.33*, $AA7(TL)(TH)

Related Topic:

Sec. 3.8, Linear Mapping

2.31 $AA5

Description: Read Target Low/High Values for Linear Mapping

Note: This command is for CB-7014D only.

Syntax: $AA5[CHK](cr)

$ Delimiter character

AA Address of module (00 to FF)

5 Command for reading target values

Response: Valid Command:

!AA(TL)(TH)[CHK](cr)

Invalid Command: **?AA[CHK](cr)**

Syntax or communication error may get no response.

! Delimiter for valid command

? Delimiter for invalid command

AA Address of responding module (00 to FF)

TL Target low values in engineering units format.

TH Target high values in engineering units format.

Example:

Command: $015 Receive: !01–10.000+10.000

Read Address 01 target value, return from –10 to +10.

Related Command:

Sec. 2.30, $AA3; *Sec. 2.32*, $AA6(SL)(SH); *Sec. 2.33*, $AA7(TL)(TH)

Related Topic:

Sec. 3.8, Linear Mapping

2.32 $AA6(SL)(SH)

Description: Set Source Low/High Values for Linear Mapping.

Note: This command is for CB-7014D only.

The data are stored in EEPROM.

Syntax: $AA6(SL)(SH)[CHK](cr)

$	Delimiter character
AA	Address of module to set (00 to FF)
6	Command for setting source values
SL	Source low level value
SH	Source high level value

Response: Valid Command: **!AA[CHK](cr)**

Invalid Command: **?AA[CHK](cr)**

Syntax or communication error may get no response.

!	Delimiter for valid command
?	Delimiter for invalid command
AA	Address of responding module (00 to FF)

Example:

Command: $016−10.000+10.000 Receive: !01

Set Address 01 source value −10 to +10; return successful.

Related Command:

Sec. 2.30, $AA3; *Sec. 2.31*, $AA5; *Sec. 2.33*, $AA7(TL)(TH)

Related Topic:

Sec. 3.8, Linear Mapping

2.33 $AA7(TL)(TH)

Description: Set Target Low/High Values for Linear Mapping

Note: The command is for CB-7014D only.

This command must follow the $AA6(SL)(SH) command.

Syntax: $AA7(TL)(TH)[CHK](cr)

$	Delimiter character
AA	Address of module to set (00 to FF)
7	Command for setting target values
TL	target low level value in engineering unit format
TH	target high level value in engineering unit format

Response: Valid Command: **!AA[CHK](cr)**

Invalid Command: **?AA[CHK](cr)**

Syntax or communication error may get no response.

!	Delimiter for valid command
?	Delimiter for invalid command
AA	Address of responding module (00 to FF)

Example:

Command: $076–10.000+10.000 Receive: !01

Set Address 01 target value –10 to +10, return successful.

Related Command:

Sec. 2.30, $AA3; *Sec. 2.31*, $AA5; *Sec. 2.32,* $AA6(SL)(SH)

Related Topic:

Sec. 3.8, Linear Mapping

2.34 $AAA

Description: Set Linear Mapping Status

Note: The command is for CB-7014D only.

Syntax: $AAA[CHK](cr)

$	Delimiter character
AA	Address of module to read (00 to FF)
A	Command for reading linear mapping status

Response: Valid Command: **!AAV[CHK](cr)**

Invalid Command: **?AA[CHK](cr)**

Syntax or communication error may get no response.

!	Delimiter for valid command
?	Delimiter for invalid command
AA	Address of responding module (00 to FF)
V	0 = disable linear mapping, 1 = enable linear mapping

Example:

Command: $01A Receive: !011

Read Address 01 linear mapping status; return enable.

Related Command:

Sec. 2.32, $AA6(SL)(SH); *Sec. 2.33,* $AA7(TL)(TH)

Related Topic:

Sec. 3.8, Linear Mapping

2.35 $AAAV

Description: Enable/Disable Linear Mapping

Note: This command is for CB-7014D only.

Syntax: $AAAV[CHK](cr)

$	Delimiter character
AA	Address of module to enable/disable (00 to FF)
A	Command for enable/disable linear mapping
V	0=disable linear mapping, 1=enable linear mapping

Response: Valid Command: **!AA[CHK](cr)**

Invalid Command: **?AA[CHK](cr)**

Syntax or communication error may get no response.

!	Delimiter for valid command
?	Delimiter for invalid command
AA	Address of responding module (00 to FF)

Example:

Command: $01A0 Receive: !01

Disable Address 01 linear mapping, return successful.

Related Command:

Sec.2.32, $AA6(SL)(SH); *Sec.2.33,* $AA7(TL)(TH)

Related Topic:

Sec.3.8, Linear Mapping

2.36 ~**

Description: Host OK.

Host sends this command to tell all modules “Host is OK”. (Actually resets the software watchdog timer, preventing time-out.)

Syntax: ~[CHK](cr)**

~ Delimiter character

** command for all modules

Response: No response.

Example:

Command: ~** No response

Send Host OK to all modules.

Related Command:

Sec.2.37, ~AA0; *Sec.2.38,* ~AA1; *Sec.2.39,* ~AA2; *Sec.2.40,* ~AA3EVV; *Sec.2.41* ~AA4; *Sec.2.42,* ~AA5PSS

Related Topic:

Set.3.2, Module Status; *Sec.3.3,* Dual Watchdog Operation

2.37 ~AA0

Description: Read Module Status

Syntax: ~AA0[CHK](cr)

~ Delimiter character

AA Address of module to read (00 to FF)

0 Command for module status

Response: Valid Command: **!AASS[CHK](cr)**

Invalid Command: **?AA[CHK](cr)**

Syntax or communication error may get no response.

! Delimiter for valid command

? Delimiter for invalid command

AA Address of responding module (00 to FF)

SS module status, 00=host watchdog status is clear, 04=host watchdog status is set. The status is stored in EEPROM and can only be reset by the ~AA1 command.

Example:

Command: ~010 Receive: !0100

Read Address 01 module status, return 00.

Command: ~020 Receive: !0204

Read Address 02 module status. A return of 04 means the host watchdog timeout status is set.

Related Command:

Sec.2.38, ~AA1; *Sec.2.40,* ~AA3EVV

Related Topic:

Set.3.2, Module Status; *Sec.3.3,* Dual Watchdog Operation

2.38 ~AA1

Description: Reset Module Status

Syntax: ~AA1[CHK](cr)

~ Delimiter character

AA Address of module to set (00 to FF)

1 Command to reset module status

Response: Valid Command: **!AA[CHK](cr)**

Invalid Command: **?AA[CHK](cr)**

Syntax or communication error may get no response.

! Delimiter for valid command

? Delimiter for invalid command

AA Address of responding module (00 to FF)

Example:

Command: ~010 Receive: !0104

Read Address 01 module status, return 04, host watchdog timeout status is set.

Command: ~011 Receive: !01

Reset Address 01 module status; return successful.

Command: ~010 Receive: !0100

Read Address 01 module status, return 00, host watchdog timeout status is clear.

Related Command:

Sec.2.36, ~**; *Sec.2.37,* ~AA0

Related Topic:

Set.3.2, Module Status; *Sec.3.3,* Dual Watchdog Operation

2.39 ~AA2

Description: Read Host Watchdog Timeout Interval

Syntax: ~AA2[CHK](cr)

~	Delimiter character
AA	Address of module to read (00 to FF)
2	Command for reading host watchdog timeout interval

Response: Valid Command: **!AAVV[CHK](cr)**

Invalid Command: **?AA[CHK](cr)**

Syntax or communication error may get no response.

!	Delimiter for valid command
?	Delimiter for invalid command
AA	Address of responding module (00 to FF)
VV	timeout interval in HEX format, each count for 0.1 second, 01 = 0.1 second and FF = 25.5 seconds

Example:

Command: ~012 Receive: !01FF

Read Address 01 host watchdog timeout interval, return FF, the host watchdog timeout interval is 25.5 seconds.

Related Command:

Sec.2.36, ~**; *Sec.2.40,* ~AA3EVV

Related Topic:

Set.3.2, Module Status; *Sec.3.3,* Dual Watchdog Operation

2.40 ~AA3EVV

Description: Set Host Watchdog Timeout Interval

Syntax: ~AA3EVV[CHK](cr)

~	Delimiter character
AA	Address of module to set (00 to FF)
3	Command for setting host watchdog timeout interval
E	1=Enable/0=Disable host watchdog
VV	timeout interval, from 01 to FF, each for 0.1 second

Response: Valid Command: **!AA[CHK](cr)**

Invalid Command: **?AA[CHK](cr)**

Syntax or communication error may get no response.

!	Delimiter for valid command
?	Delimiter for invalid command
AA	Address of responding module (00 to FF)

Example:

Command: ~013164 Receive: !01

Set Address 01 enable host watchdog and timeout interval is 64(10.0 second); returns successful.

Command: ~012 Receive: !0164

Read Address 01 host watchdog timeout interval, return 64, the timeout interval is 10.0 seconds.

Related Command:

Sec.2.36, ~**; *Sec.2.39,* ~AA2

Related Topic:

Set.3.2, Module Status; *Sec.3.3,* Dual Watchdog Operation

2.41 ~AA4

Description: Read PowerOn Value and Safe Value

Note: This command is for CB-7012/12D/12F/12FD/14D only.

Syntax: ~AA4[CHK](cr)

~ Delimiter character

AA Address of module to read (00 to FF)

4 Command for reading PowerOn Value and Safe Value

Response: Valid Command: **!AAPPSS[CHK](cr)**

Invalid Command: **?AA[CHK](cr)**

Syntax or communication error may get no response.

! Delimiter for valid command

? Delimiter for invalid command

AA Address of responding module (00 to FF)

PP PowerOn Value, 00=DO0 off, DO1 off, 01=DO0 on, DO1 off, 02=DO0 off, DO1 on, 03=DO0 on, DO1 on

SS Safe Value, 00=DO0 off, DO1 off, 01=DO0 on, DO1 off, 02=DO0 off, DO1 on, 03=DO0 on, DO1 on

Example:

Command: ~014 Receive: !010000

Read Address 01 PowerOn/Safe Value, return PowerOn Value is DO0 off, DO1 off, Safe Value is DO0 off, DO1 off.

Related Command:

Sec. 2.42, ~AA5PPSS

Related Topic:

Set. 3.2, Module Status; *Sec. 3.3,* Dual Watchdog Operation

2.42 ~AA5PPSS

Description: Set PowerOn Value and Safe Value

Note: This command is for CB-7012/12D/12F/12FD/14D only.

Syntax: ~AA5PPSS[CHK](cr)

~	Delimiter character
AA	Address of module to set (00 to FF)
5	Command for setting PowerOn Value and Safe Value
PP	PowerOn Value, 00=DO0 off, DO1 off, 01=DO0 on, DO1 off, 02=DO0 off, DO1 on, 03=DO0 on, DO1 on
SS	Safe Value, 00=DO0 off, DO1 off, 01=DO0 on, DO1 off, 02=DO0 off, DO1 on, 03=DO0 on, DO1 on

Response: Valid Command: **!AA[CHK](cr)**

Invalid Command: **?AA[CHK](cr)**

Syntax or communication error may get no response.

!	Delimiter for valid command
?	Delimiter for invalid command
AA	Address of responding module (00 to FF)

Example:

Command: ~0150003 Receive: !01

Set Address 01 PowerOn Value is DO0 off, DO1 off, Safe Value is DO0 on, DO1 on, return successful.

Related Command:

Sec.2.41, ~AA4

Related Topic:

Set. 3.2, Module Status; *Sec. 3.3,* Dual Watchdog Operation

3. Application Notes

3.1 INIT* Pin Operation

Each CB-7000 module has a build-in EEPROM to store configuration information such as address, type, baud rate and other information. Sometimes, the user may forget the configuration of the module. Therefore, the CB-7000 has a special mode named "**INIT mode**", to help user to resolve the problem. The "**INIT mode**" is setting as **Address=00, baudrate=9600bps, no checksum**

To enable INIT mode, please follow these steps:

Step 1. Power-off the module.

Step 2. Connect the INIT* pin with the GND pin.

Step 3. Power-on the module.

Step 4. Send command $002(cr) in 9600bps to read the configuration stored in the module's EEPROM.

Refer to "**7000 Bus Converter User Manual**" *Sec. 5.1* and "**Getting Started**" for more information.

3.2 Module Status

PowerOn Reset or **Module Watchdog Reset** will set all outputs to the **PowerOn Value**. The module can accept the host's command to change the output value.

Host Watchdog Timeout sets all digital outputs to the **Safe Value**.The module's status (read by command ~AA0) will be 04, and an output command will be ignored.

3.3 Dual Watchdog Operation

Dual Watchdog = Module Watchdog + Host Watchdog

The Module Watchdog is a hardware reset circuit used to monitor the module's operating status. When working in an electrically noisy environment, the module may go down from a noise signal. The outputs go to the **PowerOn Value**. The module can accept the host's command to change the output value.

The Host Watchdog is a software function to monitor the host's operating status. Its purpose is to detect a network/ communication problem or a halted host. If a timeout occurs, the module will place all outputs to their **Safe Value** to prevent any problem in the controlled unit/process.

The CB-7000 module with Dual Watchdog makes the control system safer and more reliable.

3.4 Digital Input and Event Counter

The digital input DI0 can work as an event counter. The counter updates when the input changes from a high level to a low level. The counter is 16 bits wide and useful for low speed counting at frequencies lower than 50 Hz.

3.5 Digital Output

When the module is powered on, the host watchdog timeout status is checked first. If the status is set, the digital outputs (DO0 and DO1) of module are set to the Safe Value. If the status is clear, the digital outputs are set to the PowerOn Value.

If the host watchdog timeout status is set, the module will

ignore the digital output command @AADO(Data).

3.6 High/Low Alarm

Some analog input modules, such as the CB-7012, are equipped with the high/low alarm function. When the alarm function is enabled, the digital otput DO0 is the low alarm indicator, DO1 is the high alarm indicator, and the digital output command to change the DO0 and DO1 is ignored. The alarm function is to compare the analog input value with given high alarm value and low alarm value. There are two alarm types as follows:

- **Momentary Alarm**: the alarm status is cleared when the analog input does not exceed the alarm value.

  If Analog Input Value > High Alarm, DO1 (High alarm) is on, else DO1 is off.

  If Analog Input Value < Low Alarm, DO0 (Low alarm) is on, else DO0 is off.

- **Latch Alarm**: the alarm is cleared only when the user sends a command to clear.

  If Analog Input Value > High Alarm, DO1 (High alarm) is on, else if Analog Input Value < Low Alarm, DO0 (Low alarm) is on.

3.7 Transmitter

A transmitter is an instrument that converts the signal from a sensor to a 4 to 20 mA or to a 0 to 5V signal level. Transmitters can provide driving power and have compensation circuits for the sensor signal. The output may be linearized and

amplified.

Two-wire transmitters typically output a 4 to 20 mA current output signal. One wire is for power input, the other is signal output.

Three-wire transmitters typically supply a 0 to 5V voltage output signal. One pair of wires is for power input and ground and the third wire is the signal output.

3.8 Linear Mapping

A linear mapping function translates the input value to a desired output value. Linear mapping is a algorithm that converts an analog input value into a percentage, digital, or engineering-unit value.

Linear mapping does the following:

Converts source low value (SL) to target low value(TL);

Converts Source high value(SH) to target high value(TH).

For an input value(AI), the output value is:

If AI < SL, output value = –19999. (under-limit).

Else if AI > SH, output value = +19999. (over-limit).

Else output value = (AI–SL)/(SH–SL) * (TH–TL) + TL

For example, if we connect a temperature transmitter to CB-7014/14D, suppose the sensor output is 4 mA when the input temperature is 0 deg C. and 20 mA when the temperature is 100 deg C. To read the temperature directly, we must convert the source values of 4.0 to 20.0 mA to target values, 0 to 100 deg C.

Suppose the CB-7014/14D is Address 01, the baud rate is 9600 bps, and no-checksum.

1. Set the CB-7014D to read ±20 mA type.

   Command: *%01010D0600* Receive: *!01*

   (Ref. *Sec. 2.1* %AANNTTCCFF)

2. Set the source low value(SL)=4 and source high value (SH)=20.

   Command: *$016+04.000+20.000* Receive: *!01*

   (Ref. *Sec. 2.32* $AA6(SL)(SH))

3. Set the target low value (TL)=0 and target high value (TH)=100.

   Command: *$017+000.00+100.00* Receive: *!01*

   (Ref. *Sec. 2.33*, $AA7(TL)(TH))

4. Enable linear mapping function.

   Command: *$01A1* Receive: *!01*

   (Ref. *Sec. 2.34*, $AAAV)

   We'll read the temperature value from CB-7014D directly using command #AA.

EC Declaration of Conformity

We, **Measurement Computing Corporation**, declare under sole responsibility that the product:

Part Number	Description
CB-7012/7014/7017	Analog Input Modules

to which this declaration relates, meets the essential requirements, is in conformity with, and CE marking has been applied according to the relevant EC Directives listed below using the relevant section of the following EC standards and other normative documents:

EU EMC Directive 89/336/EEC: Essential requirements relating to electromagnetic compatibility.

EU 55022 Class B: Limits and methods of measurements of radio interference characteristics of information technology equipment.

EN 50082-1: EC generic immunity requirements.

IEC 801-2: Electrostatic discharge requirements for industrial process measurement and control equipment.

IEC 801-3: Radiated electromagnetic field requirements for industrial process measurements and control equipment.

IEC 801-4: Electrically fast transients for industrial process measurement and control equipment.

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